

The opinion in support of the decision being entered today
is *not* binding precedent of the Board.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte STEPHEN E. GRECO

Appeal 2007-3375
Application 10/604,011
Technology Center 1700

Decided: August 31, 2007

Before EDWARD C. KIMLIN, THOMAS A. WALTZ, and
JEFFREY T. SMITH, *Administrative Patent Judges*.

SMITH, *Administrative Patent Judge*.

DECISION ON APPEAL

Statement of the Case

This is an appeal under 35 U.S.C. § 134 from a final rejection
of claims 1-5 and 7-30. We have jurisdiction under 35 U.S.C. § 6.

Appellant's invention relates to an integrated circuit
comprising a fuse and fuse opening method. The method for fuse

opening involves wet etching techniques. Claims 1 and 30 are illustrative:

1. A method for opening an integrated circuit fuse, the method comprising the steps of:
generating at least one opening to a fuse element that couples a plurality of terminals and is located in a non-last metal layer; and
wet etching the fuse element to open the fuse.

30. An integrated circuit comprising:
an opened fuse area including a metal liner of a fuse element, the fuse element having been removed to generate the opened fuse area, the metal liner being intact immediately adjacent to, and in non-contact, with a plurality of terminals.

The Examiner relies on the following references in rejecting the appealed subject matter:

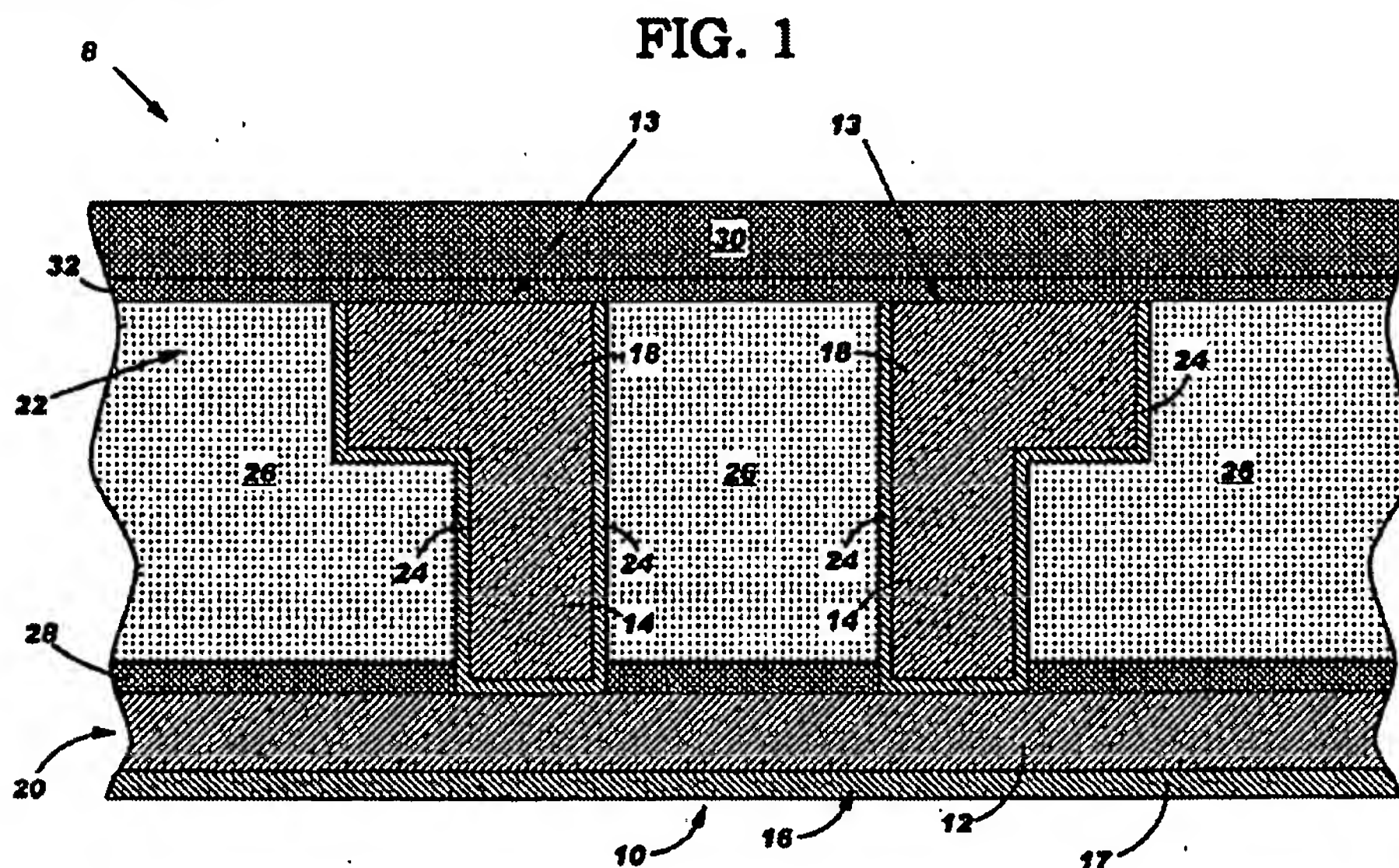
Huggins	US 5,953,577	Sep. 14, 1999
Daubenspeck	US 6,498,385 B1	Dec. 24, 2002

Claims 1-4 and 7-30 stand rejected under 35 U.S.C. §102(e) over Daubenspeck; and claim 5 stands rejected under 35 U.S.C. § 103(a) over Daubenspeck in view of Huggins.

We REVERSE.

The Specification, paragraph [0019], describes Figure 1 which is a representative integrated circuit as follows:

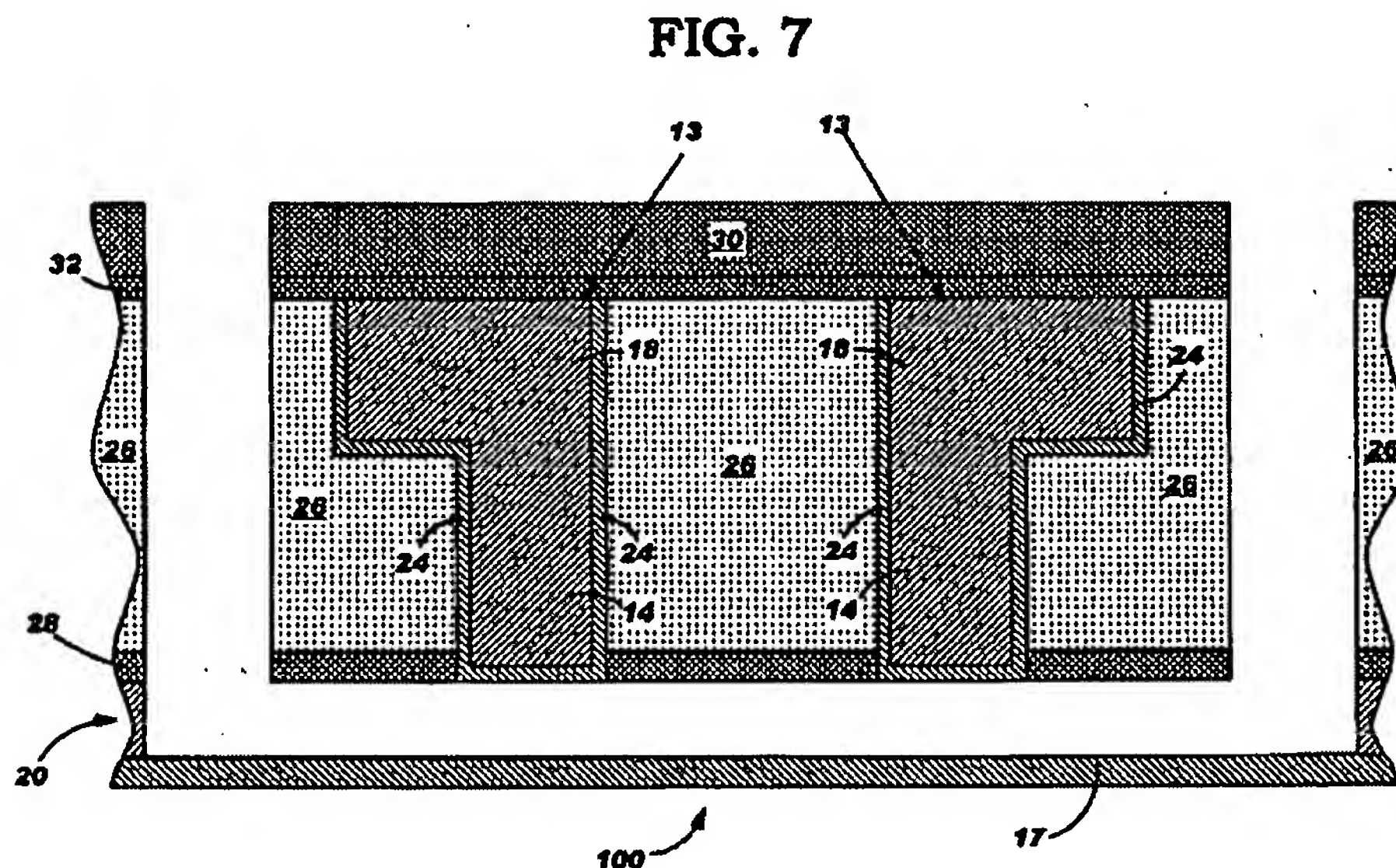
FIG. 1 is cross-sectional view of an integrated circuit (IC) 8 including one embodiment of an IC fuse 10 according to the invention. IC fuse 10 includes a plurality of terminals 13 coupled by a fuse element 16. In the FIG. 1 embodiment, fuse element 16 is provided in the form of a horizontal wire 12 that couples terminals 13, which each include a stud 14 and a horizontal wire 18. In the FIG. 1 embodiment, terminals 13 are also located in the same layer. It is understood that each wire 18 continues on in a direction perpendicular to the page, i.e., into and/or out of the page. Each stud 14 is provided as a vertical wire and couples at least one respective wire 18 to fuse element 16. Each stud 14 and wire 18 includes a metal liner 24 of, for example, tantalum, tungsten, titanium nitride, or any other liner metal used for such purposes. Each stud 14 is fully-landed on a wire 12 of fuse element 16. That is, each metal liner 24 is on top of wire 12 of fuse element 16, and does not contact a metal liner 17 that surrounds at least a portion of fuse element 16.



The Specification discloses that etching chemistry can be altered as necessary during the course of the opening operation to remove all layers and stop on top of wire 12 of fuse element 16.

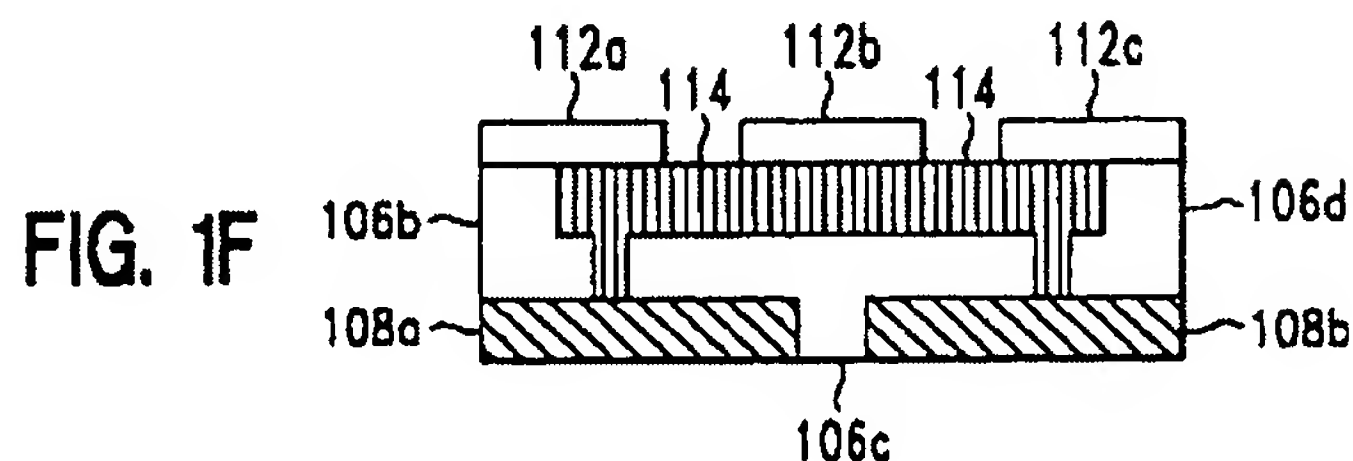
Reactive ion etching (RIE) is utilized to remove the passivation layer 30 and the insulator 26. (Specification [0023]-[0027]).

Figure 7, below, depicts an integrated circuit that includes an open fuse area adjacent to and beneath terminals 13.



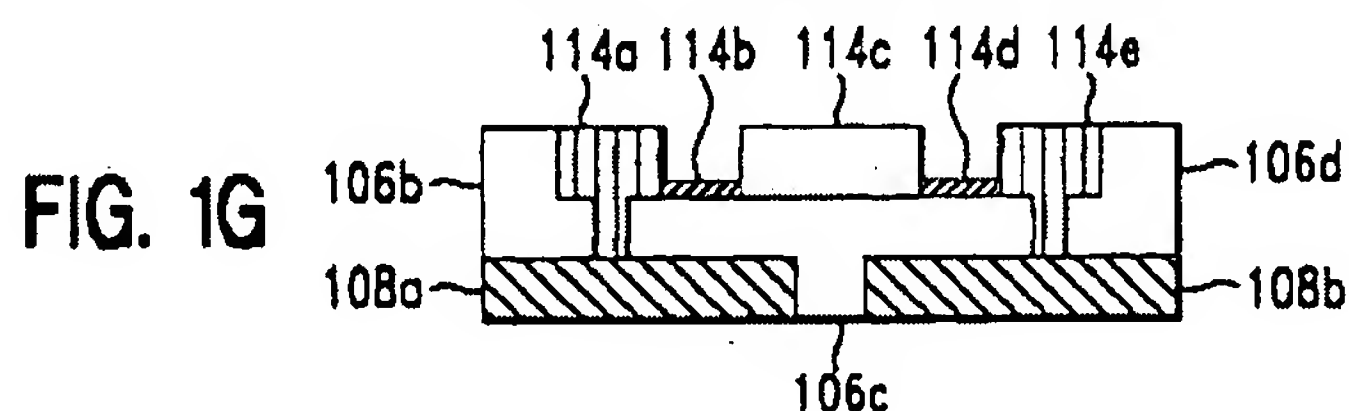
The Examiner, Answer 3-4, found that Daubenspeck discloses a method of opening an integrated circuit comprising lithographically patterning the resist layer formed on an integrated circuit structure (IC chip). According to the Examiner, the fuse of the IC chip is coupled to a plurality of terminals that are landed on an upper surface of the wire/fuse element (LM-1 layer). The Examiner describes the LM-1 layer as the non-last metal layer citing Figure 1F (Answer 4).

Daubenspeck, Figure 1F appears below:



According to the Examiner, Daubenspeck's Figure 1G depicts a structure having an opening to each side of the terminal (copper). Figures 7A-7D depict a fuse, including the liner, that has been removed leaving behind the metal liner segments of the terminal intact (Answer 4). The Examiner asserts that "Daubenspeck . . . discloses that the fuse includes a wire and the terminals are positioned (fully-landed) on the fuse wire (copper) (*see* figure 1 G), wherein each terminal includes a Ta or TaN liner, each terminal comprises a horizontal wire and a vertical stud (*see* figure 1G, reference 114a) said fuse wire couples the vertical studs, and the horizontal wire couples the fuse to the terminals." (Answer 4).

Daubenspeck, Figure 1G appears below:



Appellant contends that with regard to independent claims 1, 12, and 19, Daubenspeck fails to disclose a fuse element that is located in a non-last metal layer. Appellant states "[t]he fuse 114 of Daubenspeck is clearly never in the non-last metal layer. In FIGS. 1A-1G of Daubenspeck, 'last metal minus 1 (LM-1) layer segments

108a, 108b' are shown below fuse 114. (Col. 8, line 56). Since fuse element 114 is metal and is above LM- 1 layer segments 108a, 108b, fuse 114 [sic, must] be in the last metal layer; and, therefore, logically cannot be in a non-last metal layer." (Br. 4).

In response to the Appellant's position, the Examiner contends that the liner material of the fuse element formed from Ta/TaN is the non-last metal layer in the integrated circuit of Daubenspeck (Answer 5). Appellant responds that the Examiner's interpretation of the liner material is contradictory to the standards utilized in semiconductor fabrication. Appellant contends a person of ordinary skill in the art understands that liners are used to prevent the diffusion of metal into a dielectric and accompany practically all metal in semiconductor devices (Reply Br. 2). The Examiner has failed to respond to the Appellant's position regarding the liner material.^{1, 2}

Regarding the subject matter of independent claims 26 and 30, we agree with the Appellant. The Examiner has not adequately identified the element of Daubenspeck that describes a terminal that is fully landed on the upper surface of a wire of the fuse element as

¹ The Examiner had the opportunity to dispute the Appellant's position by responding to the Reply Brief. However, the Examiner merely indicated that the Reply Brief had been considered and entered into the record (*see* the Office Action dated April 20, 2007).

² Assuming that the Examiner's interpretation of the liner material was correct, the invention of Daubenspeck would not anticipate the claimed invention because the fuse element 114c (absent the liner material) would not have been coupled to the plurality of terminals.

recited in claim 26 and an open fuse line that includes a metal liner as recited in claim 30 (Br. 5-6, Reply Br. 3-4).

For the reasons set forth above and in the Briefs, the Examiner has not established that Daubenspeck is evidence that the claimed invention was previously known to others. Anticipation under § 102 requires that the identical invention that is claimed was previously known to others and thus is not new. *Scripps Clinic & Research Foundation v. Genentech, Inc.*, 927 F.2d 1565, 1576, 18 USPQ2d 1001, 1010 (Fed. Cir. 1991).

The addition of Huggins to the teachings of Daubenspeck does not remedy the difference between the claimed invention and Daubenspeck identified above. Therefore, we reverse the rejection of claim 5 under 35 U.S.C. § 103(a) for the reasons set forth above.

ORDER

The Examiner's decision rejecting claims 1-5 and 7-30 is reversed.

REVERSED

tf/lr

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